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Dodge

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[54] **ADJUSTABLE LIFTING DEVICE FOR SEWER FRAME OR THE LIKE**

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[52] **U.S. Cl.** **294/81.21**; 294/81.6; 294/93

[58] **Field of Search** 294/67.1, 67.3, 67.33, 294/81.1-81.21, 81.54, 81.56, 81.62, 90, 93-97

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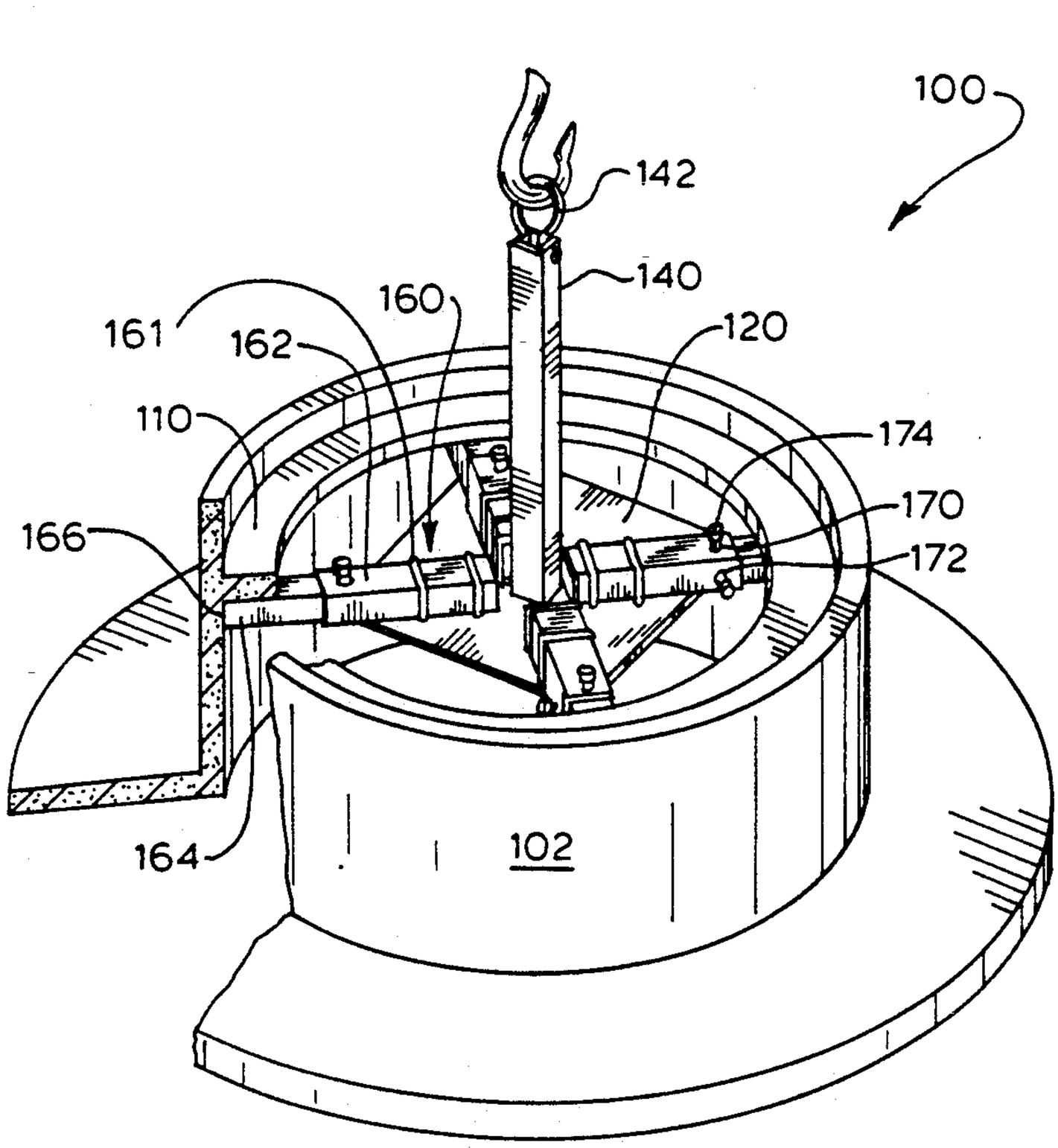
[57] **ABSTRACT**

A device for lifting heavy items such as manhole frames has four adjustable arms for securing the device to the sewer frame or similar item and a lifting arm for connecting the device to a machine for lifting and moving the item.

3 Claims, 5 Drawing Sheets



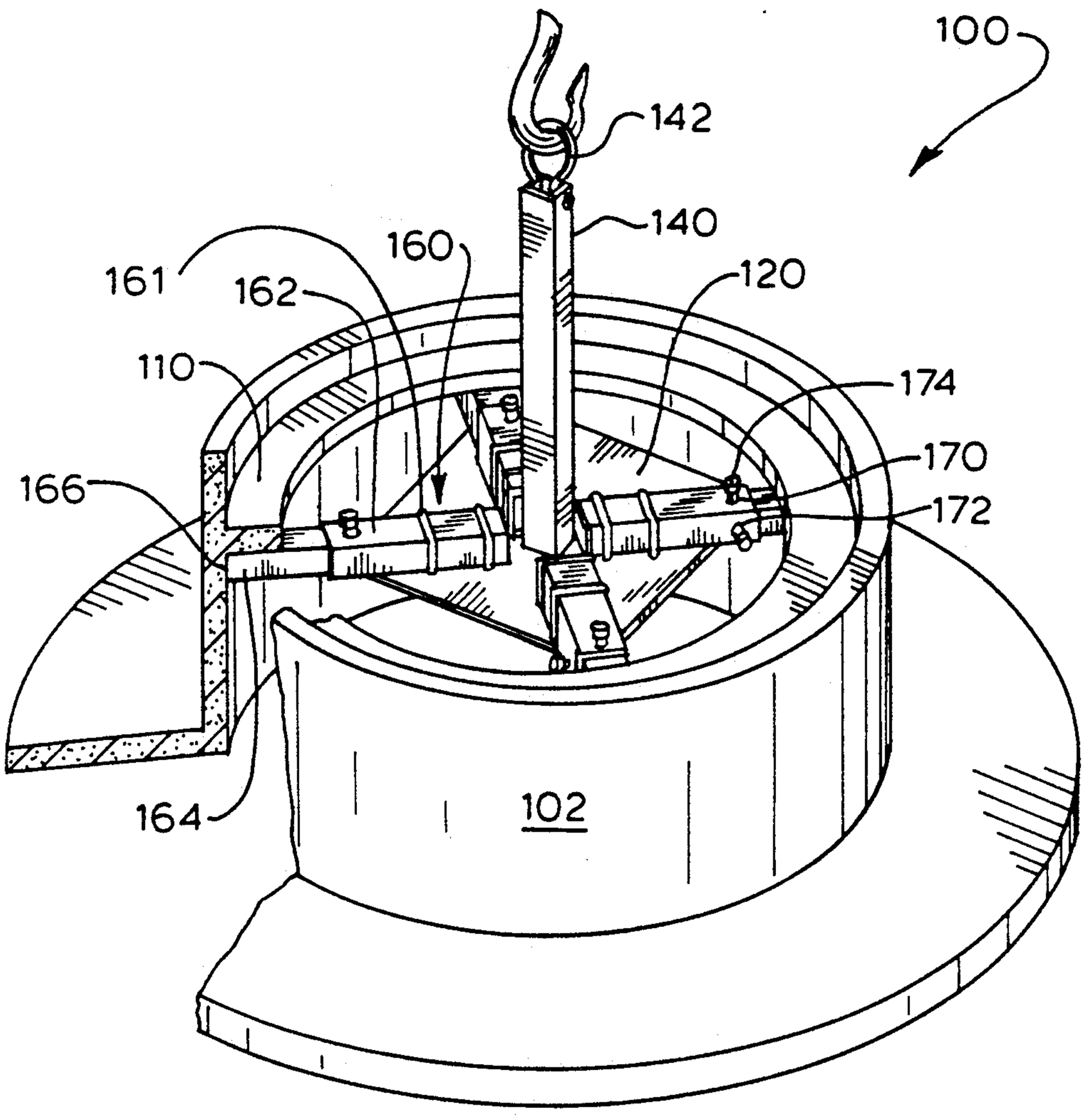
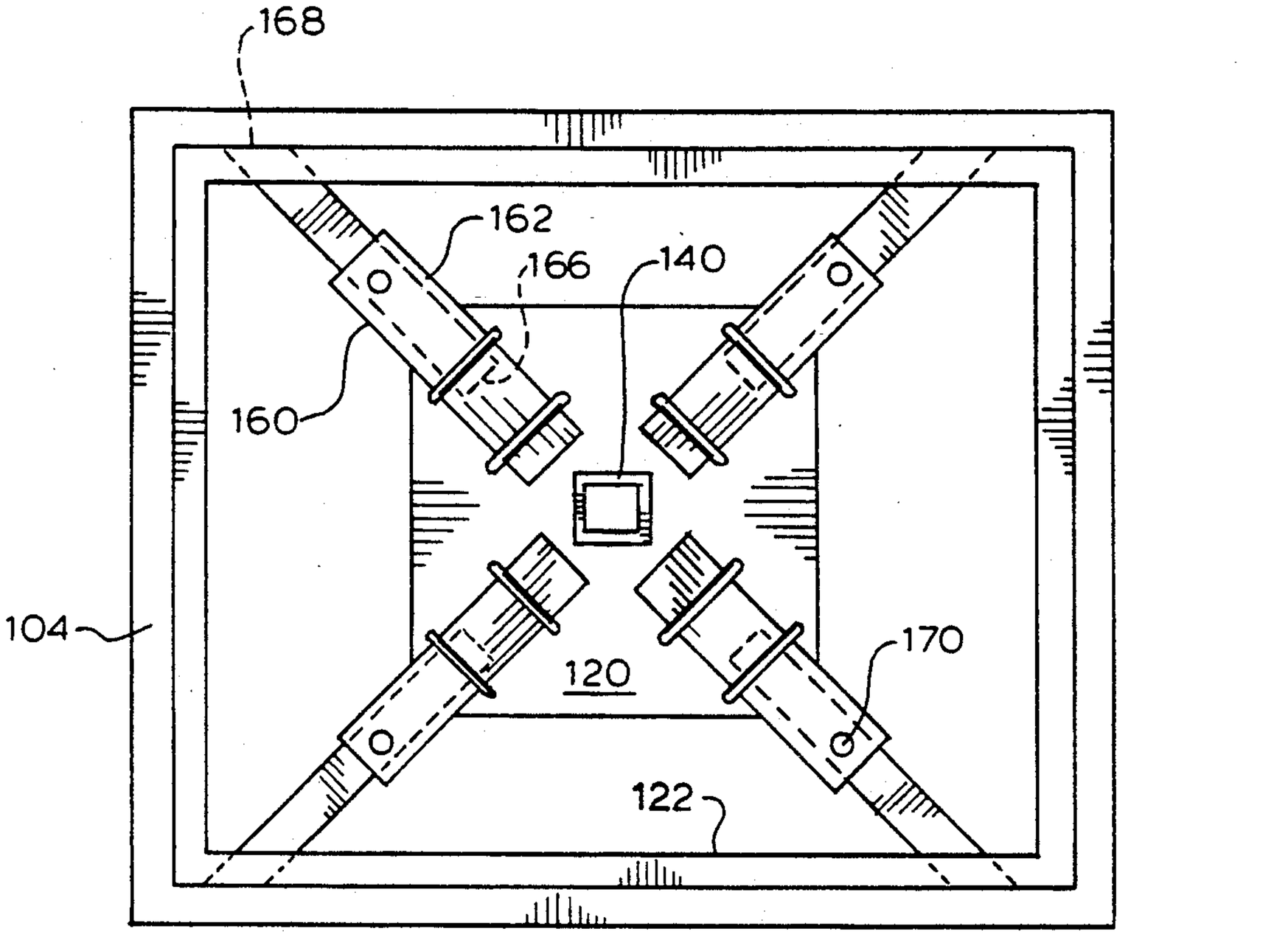


FIG. 1

FIG. 2


168
162
166
140
160
104
120
170
122

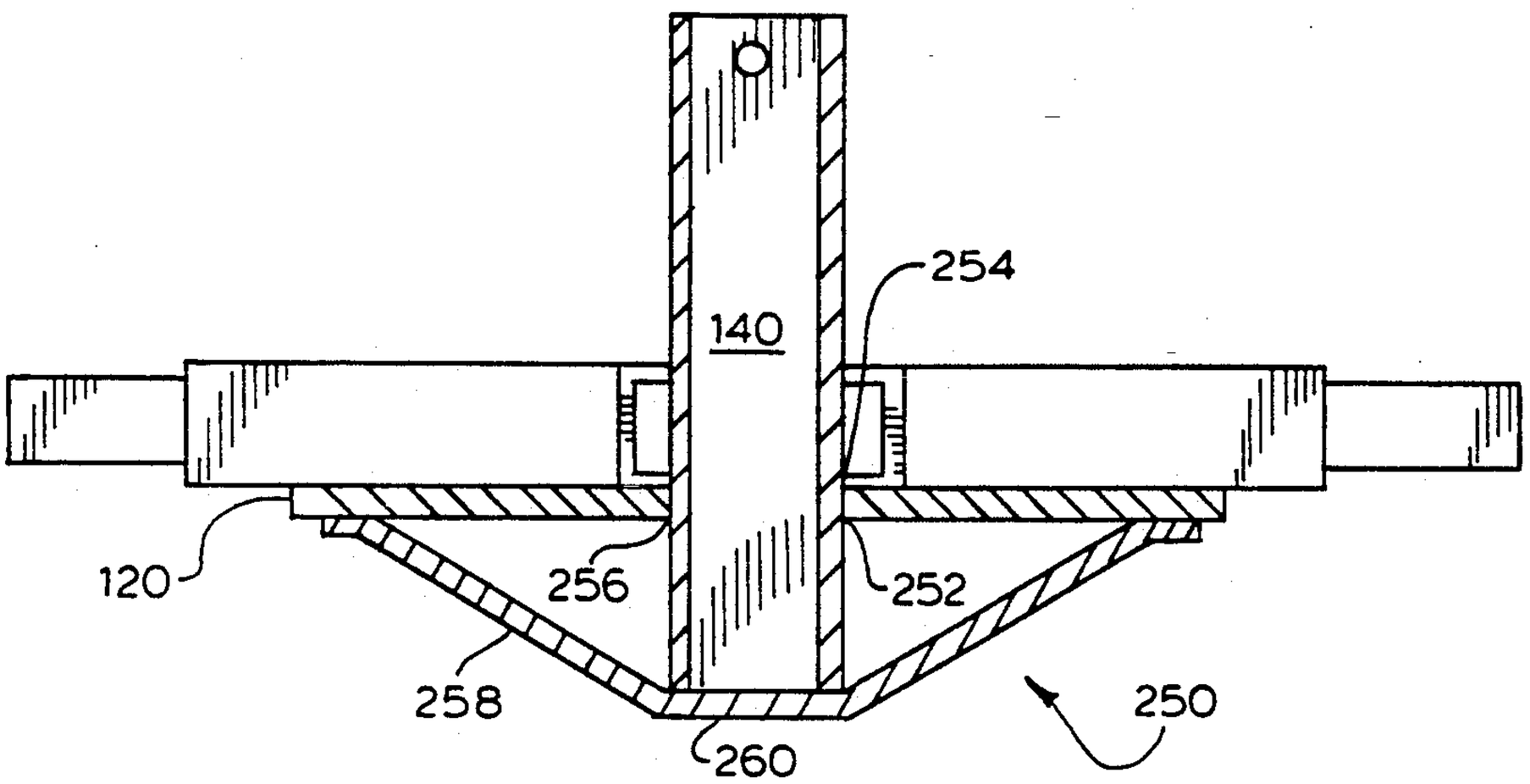
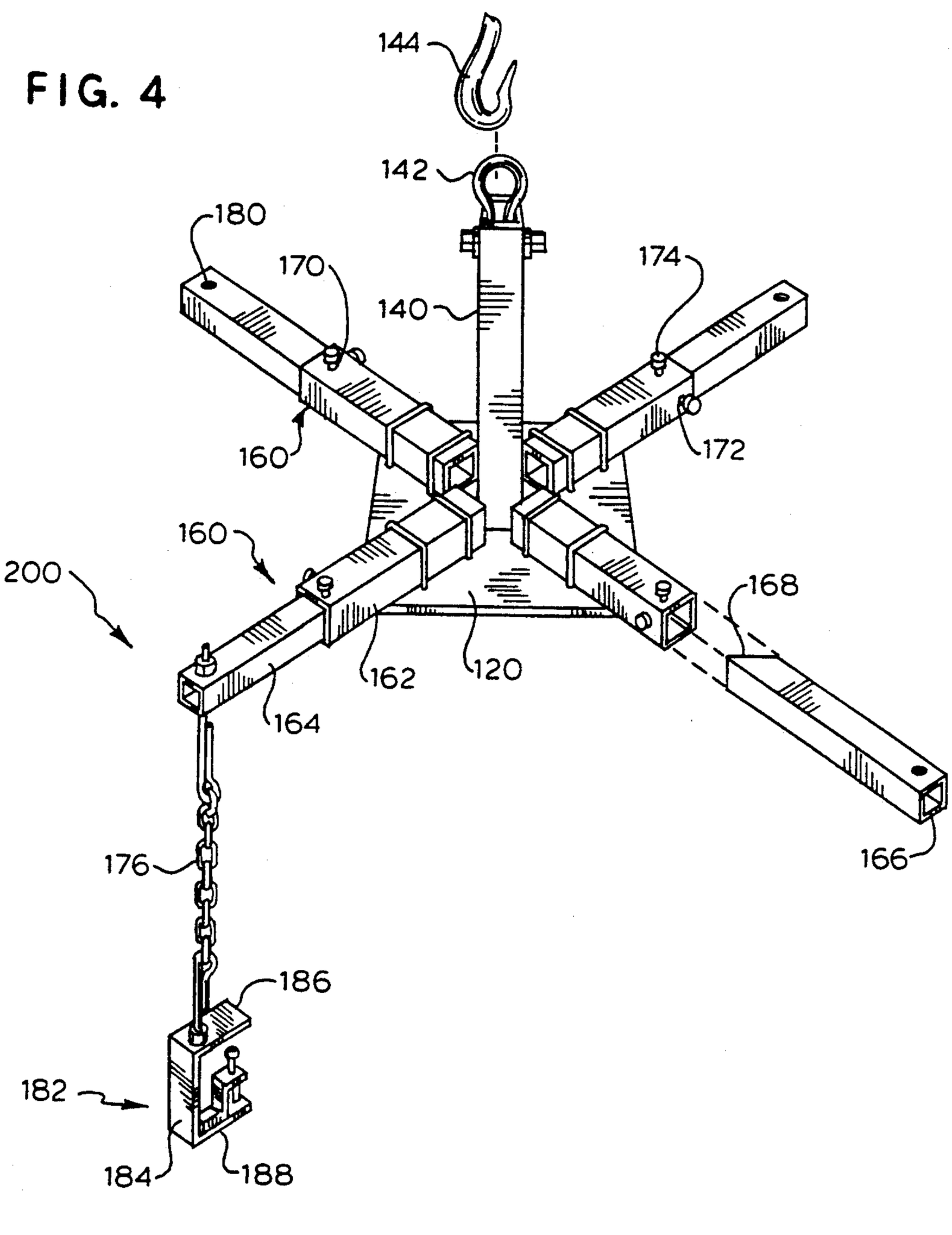

140
254
120
256
252
258
260
250

FIG. 3

FIG. 4


144
142
180
170
140
174
160
172
160
200
168
162
120
164
176
186
182
184
188
166

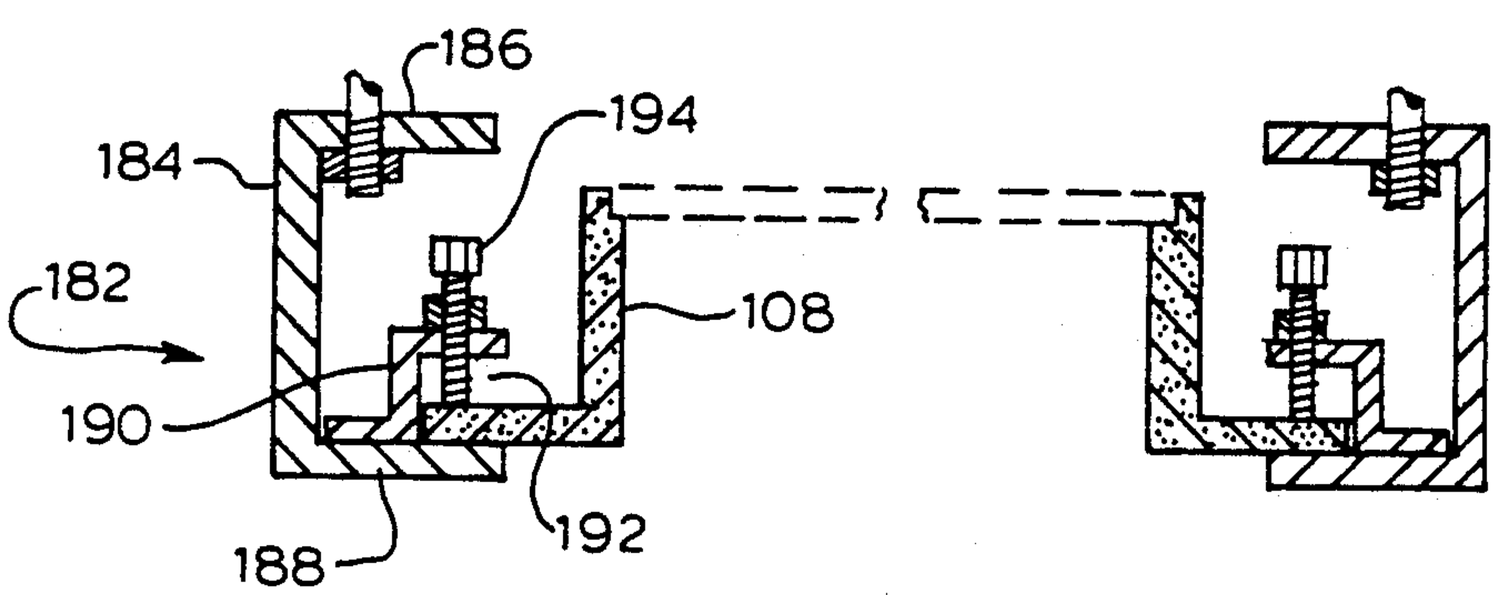

186
184
194
182
108
190
188
192

FIG. 5

FIG. 6

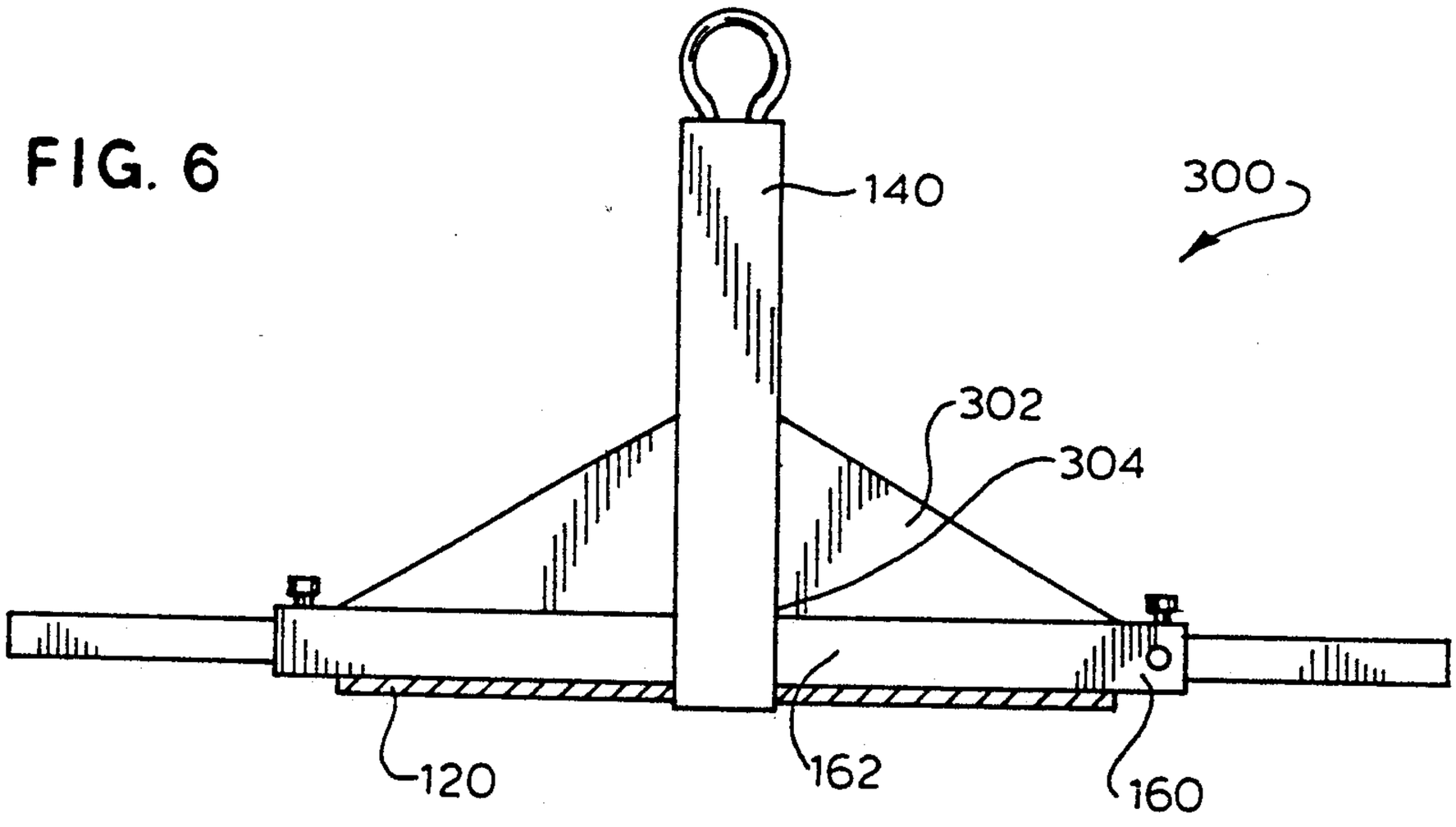


FIG. 7

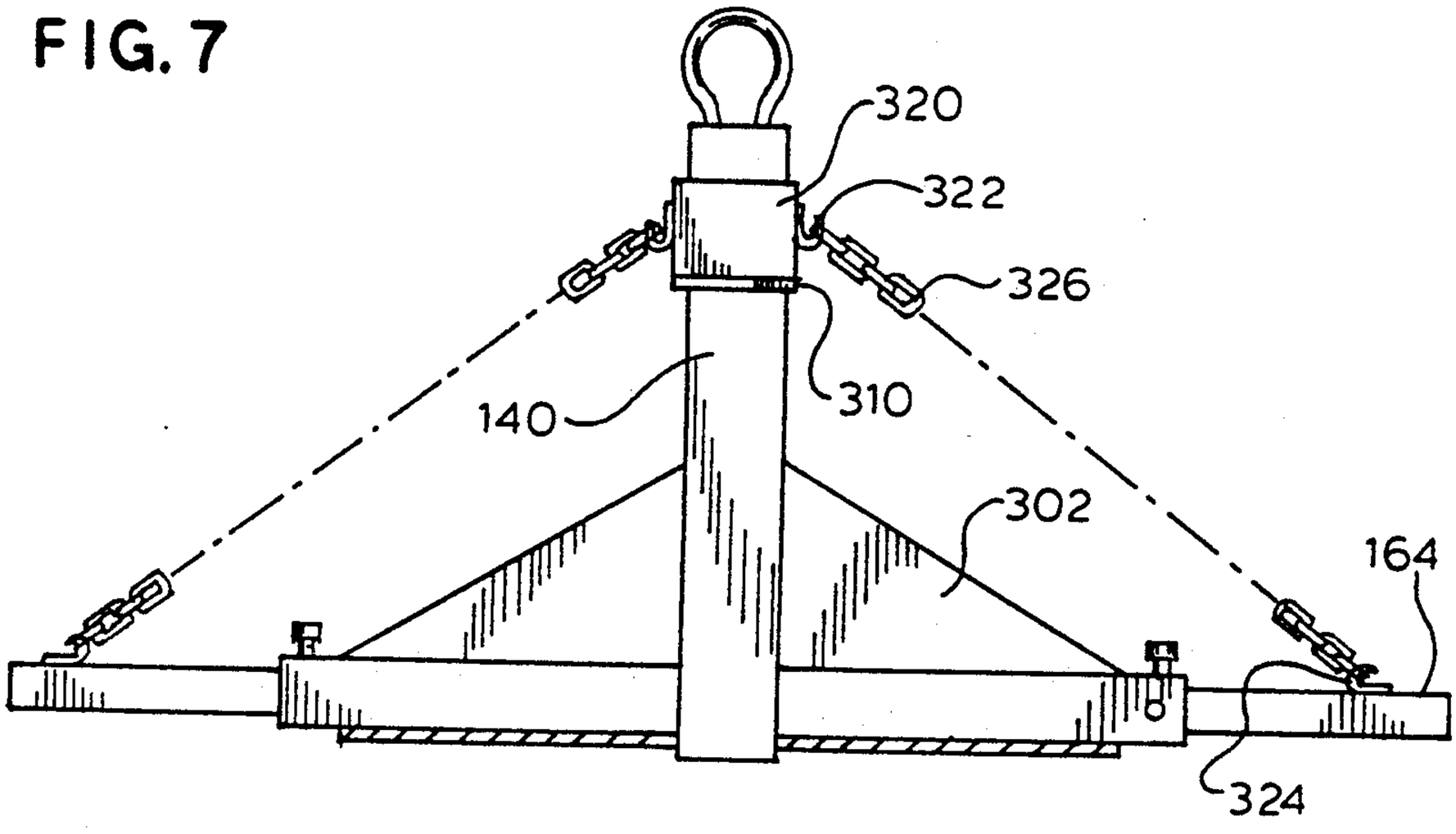
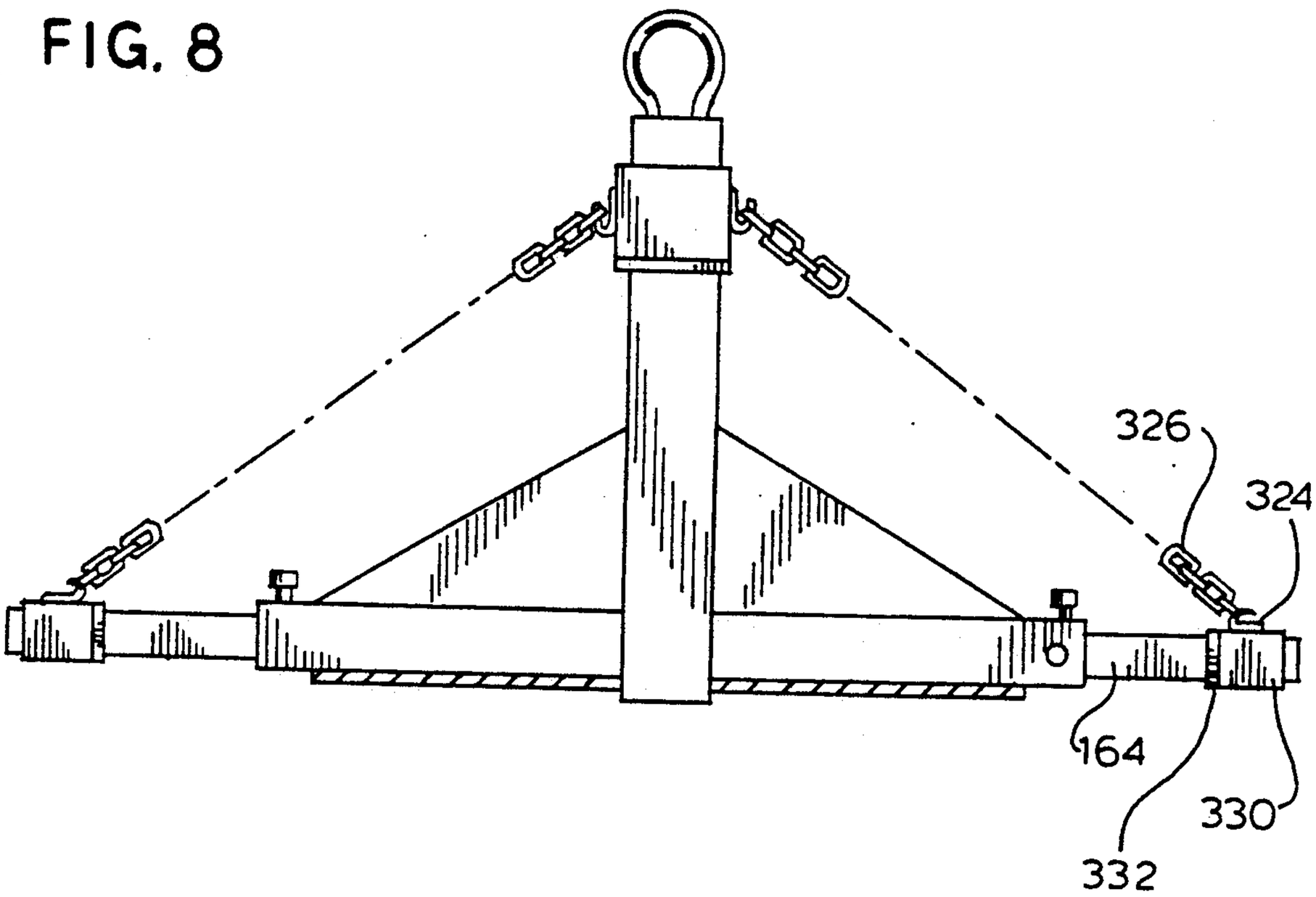


FIG. 8



ADJUSTABLE LIFTING DEVICE FOR SEWER FRAME OR THE LIKE

This invention relates to a lifting device, and more specifically to an adjustable lifting device for lifting into place a manhole, a frame, a storm frame, a sewer frame (with or without an inner lip) or any round, square or rectangular object.

BACKGROUND OF THE INVENTION

In construction work, many heavy items must be lifted, moved, and placed in a proper position. These items have in common both great weight and bulkiness. Sewer construction materials form a prominent number of these items. Clearly such items are difficult to handle efficiently and safely.

A manhole frame and a storm frame are typical of the heavy pieces of metal that must be placed in order to complete a sewer project. The extreme weight and bulkiness of such an element make that element very difficult to place appropriately. Traditionally, at least two, if not four and usually more, laborers are required to lift that element into place.

There is no good way to lift that device with a machine. There is no good way to get a handle on it with the machine. Thus, the construction crew is left with the necessity of physically moving the device into position.

These elements also come in many different shapes and sizes. It is desirable to be able to lift each of them with one simple device that is adaptable to a wide range of construction equipment that is found on the job. Such an adaptable, lifting device is not available. A device of this type can be very useful. If such a lifting device is developed, it can also be used for lifting a wide variety of other heavy elements.

With regard to a sewer frame or a manhole frame, it is difficult to put a sufficiently strong lifting mechanism on the frame itself. The lifting mechanism must be strong yet, while still avoiding interference with the construction process. It must also not interfere with the making of the frame itself. Accordingly, the idea of attaching a lifting mechanism directly to the frame is not a good solution to the problem.

SUMMARY OF THE INVENTION

Among the many objectives of this invention is the provision of an adjustable lifting device to assist in a construction project, requiring the movement and placement of a heavy element.

A further objective of this invention is to provide an adjustable lifting device to assist in the placing of a sewer frame or a storm frame.

A still further objective of this invention is to provide an adjustable lifting device to adjust to the size of a sewer frame or a storm frame.

Yet a further objective of this invention is to provide an adjustable lifting device to adjust to the shape of a sewer frame or a storm frame.

Also an objective of this invention is to provide an adjustable lifting device for lifting a heavy item with a machine.

Another objective of this invention is to provide an adjustable lifting device for placing a heavy item with a machine.

Yet another objective of the is invention is to provide an adjustable lifting device for moving a heavy item with a machine.

Still another objective of this invention is to provide a method for placing of a sewer frame or a storm frame.

These and other objectives of the invention (which other objectives become clear by consideration of the specification, claims and drawings as a whole) are met by providing an adjustable lifting device, which includes a lifting frame, with at least one adjustable arm thereon and a lifting arm secured thereto.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** depicts a top perspective view of the adjustable lifting device **100** of this invention, as applied to round sewer frame **102**.

FIG. **2** depicts a top plan view of the adjustable lifting device **100** of this invention, as applied to square sewer frame **104**.

FIG. **3** depicts a side, partially cross-sectional view of the heavy duty lifting device **250** showing adjustable lifting arm **120**.

FIG. **4** depicts a top perspective view of the chain lifting device **200** of this invention.

FIG. **5** depicts a side, partially cross-sectional view of the chain lifting device **200** of this invention, applied to a lipless sewer frame **108**.

FIG. **6** depicts a side, partially cross-sectional view of the reinforced lifting device **300** showing buttress **302**.

FIG. **7** depicts a side, partially cross-sectional view of the reinforced lifting device **300** showing collar hook **322**.

FIG. **8** depicts a side, partially cross-sectional view of the reinforced lifting device **300** showing collar hook **322** and movable arm hook **324**.

Throughout the figures of the drawings, where the same part appears in more than one figure of the drawings, the same number is applied thereto.

DESCRIPTION

The lifting device of this invention includes a frame. Mounted on the frame is a lifting arm. The lifting arm is attachable to any power implement such as a backhoe or other similar device. Extending from the frame are a plurality of arms radially spaced around the frame. The frame is generally a flat platform having the lifting device mounted thereon. The radial arms include a fixed member mounted to the frame and a slidable member mounted therein. The slidable member can be extended beyond the frame and fit into the inner lip of a manhole frame. The slidable or radial arm can be fixed in place by bolting or other suitable devices and locked under the lip of the manhole frame. In this fashion, the backhoe or other suitable machine (not shown) can be attached to the lifting arm and lift the manhole frame or similar item, so that it may be transferred to the appropriate place.

Clearly, the purpose of this device is to lift and set into place a manhole cover, a storm frame, a sewer frame; or any round, square, or rectangular heavy object. The lifting device of this invention is designed to lift the object from either the inside of the frame if there is an inside lip or from the outside of the frame by using a formed clamping device with a setting bolt or other clamping mechanism.

The slidable arms can be replaceable. This replacement can compensate for the different shapes of the manhole cover such as the square manhole or the round

manhole frame as desired, by providing an appropriately shaped arm. When the slidable arm wears out, it may be simply replaced.

Additionally, the slidable arms can have different shapes on either end thereof. This factor can compensate for the different shapes of the frame being installed, such as the square manhole or the round manhole frame as desired.

The arms are adjustable to fit different sized objects. The arms lock into place by setting bolts or other suitable means. When lifting from the outside of an object, the formed clamps are attached to chains or other flexible devices and the chains are attached to the adjustable arms.

On the occasion when there is no inner lip in the manhole frame, a chain mechanism or other suitable flexible device may be secured to the end of each arm. At the other end of the chain is a clamp which may be clamped onto the outer lip of the frame. By clamping the outer lip of the frame within the clamp device and lifting the clamp with the chain and the similar frame, great advantages are obtained in lifting even the manhole frames without the inside lip.

It is also possible for a very heavy duty concept of the lifting device to extend the lifting arm down through the frame. The frame can then be buttressed thereby securing the lifting arm again to the frame and strengthening the device overall. In this fashion, greater weights can be lifted by the device of this invention.

As shown in FIG. **1**, clearly the purpose of this lifting device **100** is to lift and set into place a round sewer frame **102** or any similar item such as a manhole cover, a storm frame, a sewer frame; or any round, square, or rectangular heavy object. The lifting device **100** of this invention is designed to lift the object from either the inside of the sewer frame **102** if there is an inside lip or from the outside of the sewer frame **102** by using a formed clamping device with a setting bolt or other clamping mechanism.

The lifting device **100** of this invention includes a lifting frame **120**. Mounted on the lifting frame **120** is a lifting arm **140**. The lifting arm **140** is attachable to any power implement such as a backhoe (not shown) or other similar device. Extending from the lifting frame **120** are a plurality of arms **160** radially spaced around the lifting frame **120**. The lifting frame **120** is generally a flat platform having the lifting arm **140** and at least two radial arms **160** mounted thereon.

To form the radial arm **160**, a fixed member **162** is mounted to the lifting frame **120** with U-bolts **161**, welds or a similar method, and a slidable member **164** mounted slidably and fixably mountable in fixed member **162**. The slidable member **164** can be extended beyond the lifting frame **120** and fit into the inner lip of a sewer frame **102**. The slidable member **164** is secured in the fixed member **162** by a lock bolt **174** or other suitable devices.

The slidable member **164** is extended sufficiently so that all slidable members **164** can be locked under the lip **110** of the sewer frame **102**. In this fashion, the backhoe or other suitable machine (not shown) can be attached to the lifting arm **140** and lift the sewer frame **102** or similar item, so that it may be transferred to the appropriate place.

The slidable arms **160** can be replaceable. This replacement can compensate for the different shapes of the manhole cover such as the square manhole or the round sewer frame **102** as desired, by providing an appropriately shaped arm. When the slidable arm **160** wears out, the slidable member **164** may be simply replaced.

Additionally, the slidable arms **160** can have different shapes on either end thereof. This factor can compensate for the different shapes of the heavy frame being installed, such as the square sewer frame **104** of FIG. **2** or the round sewer frame **102** of FIG. **1** as desired.

The arms **160** are adjustable to fit different sized objects. The arms **160** lock into place by setting bolts or other suitable means. When lifting from the outside of an object, the formed clamps are attached to chains or other flexible devices and the chains are attached to the adjustable arms.

The frame **120** of this device **100** can be a flat piece of sheet metal having a suitable thickness for the desired strength. Preferably, this sheet metal has a thickness of up to 2 centimeters. More preferably, the thickness of the frame **120** is from about one-tenth of a centimeter to 1.5 centimeters. Most preferably, the thickness is about 0.2 of a centimeter to 1 centimeter.

The referenced thicknesses assume that the weight being lifted is about 200 to 300 kilograms. If the weight increases or decreases, the thickness of the frame **120** can be adjusted for additional strength. Similar adjustments can be made in other elements of the device **100**. This flat piece of metal for frame **120** is of any suitable shape.

Secured to the frame **120** is the lifting arm **140**. The lifting arm **140** is generally centrally located in the frame **120**. The lifting arm **140** is secured to the surface of the frame **120** by welding, bolting or another suitable mechanism. The lifting arm **140** has at the other end a lifting ring **142** suitable for receiving a hook **144** attached to a lifting chain (not shown) or other lifting device attached to a backhoe (not shown) or similar instrument. As the hook **144** is looped through the lifting ring **142**, the lifting arm **140** can lift the frame **120**. The lifting arm **140** may also be bolted or otherwise secured to the frame **120**.

Each slidable arm **160** includes a fixed member **162** is tubular in nature and secured to the frame **120**. Within the fixed member **162** is a slidable tubular member **164** slidably mounted therein. The slidable tubular member **164** has the great capability of sliding in and out of the fixed member **162** so that the length of the slidable arms **160** may be adjusted. In this fashion, the slidable arms **160** are adjusted to fit into the storm frame or the sewer frame.

FIG. **2** combines with FIG. **1** to show that first end **166** of the slidable member **164** is shaped in any suitable fashion. The first end **166** is shaped preferably as a rectangle. This with three other radial arms **160** comprise the lifting mechanism for the interior lip of a storm frame.

The second end **168** of the slidable member **164** may be an angled end **168** suitable for lifting of a square storm frame **104**. Each second end **168** can fit inside the lip **122** of a storm frame or sewer frame and attach thereto.

Fixed member **162** has a plurality of fixed member apertures **170** which line up with each slidable member **164** and receive lock bolts **174** thereon for the purpose of locking the radial arms **160** in the proper position. This adjustment permits easy adjusting of the radial arm **160**. The lock bolt **174**, combined with the apertures **170** and **172**, may also be replaced by a pawl and rachet

assembly which can position the radial arms **160** within the storm frame **120** also.

FIG. **3** depicts heavy duty lifting device **250**. If it is desired to more firmly attach the lifting arm **140** to the frame **120**, the frame **120** can have frame aperture **252** and the lifting arm **140** mounted therethrough. The lifting arm **140** is then welded in two areas on the upper part **254** and lower part **256** of the frame **120** to the lifting arm **140**. A subsequent support bar **258** can be put across the base **260** of the lifting arm **140** and secured to the frame **120** to further strengthen the lifting mechanism of the frame **120** and the lifting arm **140**. In this fashion, a very durable device can be made for lifting much heavier objects.

By considering FIG. **4** and FIG. **5**, it is possible to have an end aperture **180** in slidable member **164** and form chain lift **200**. This end aperture **180** can receive a chain or similar mechanism. Upon receiving a lifting chain **176**, a clamp **182** can be secured to the opposing end of lifting chain **176**. Chain **176** may also be secured to arm **160** in any other suitable fashion.

This clamp **182** includes a C-member **184** having a top portion **186** of the C-member **184** secured to the chain and a bottom portion **188** of the C-member **184** having a second bar **190** thereby forming a gap **192** with the bottom portion **188** of the C-member **184**.

A frame bolt **194** is mounted in the second bar **190** and is rotated downwardly when the edge of a storm frame **120** is inserted therebetween. With the plurality of three other arms **160** and chains **174**, the frame **120** may be lifted into position. This assumes for the sake of argument that the item being lifted is lipless sewer frame **108**, which has no lip inside to use the other embodiments.

On the occasion when there is no inner lip in the sewer frame **102**, a chain mechanism or other suitable flexible device may be secured to the end of each arm. At the other end of the chain is a clamp which may be clamped onto the outer lip of the lifting frame **120**. By clamping the outer lip of the lifting frame **120** within the clamp **182** and lifting the clamp **182** with the chain **174** and the similar lifting frame **120**, great advantages are obtained in lifting even the manhole lifting frames without the lip.

It is also possible for a very heavy duty concept of the lifting device **100** to extend the lifting arm **140** down through the lifting frame **120**. The lifting frame **120** can then be buttressed thereby securing the lifting arm **140** again to the lifting frame **120** and strengthening the device **100** over all. In this fashion, greater weights can be achieved.

Because of the generically heavy items designed to be moved by a device of this invention, FIG. **6** depicts a highly preferred, reinforced lifting device **300** within the scope of this invention. The lifting device **300** has in addition to lifting device **100**, up to four of a buttress **302**. Customarily, there is one buttress **302** for each arm **160**.

The reinforced lifting device **300** has much of the standard structure of the other devices. Common is the lifting frame **120** and the lifting arm **140**. However, a buttress **302** supports lifting arm **140** in relation to the fixed member **162**. Buttress **302** is preferably a right triangle flat piece of metal having a right angle at the juncture **304** of lifting arm **140** and fixed member **162**. By welding or otherwise securing buttress **302** on each fixed member **162** and lifting arm **140**, great strength is added.

FIG. **7** depicts a modification of FIG. **6** with the addition of stop member **310**, lifting collar **320** and collar hook **322**. Lifting arm **140** is modified by having a stop member **310** welded or otherwise secured thereon. The stop member **310** is mounted slightly above the buttess **302**. With stop member **310**, the lifting collar **320** is slidably mounted over lifting arm **140** and spaced from buttress **302** by stop **310**.

On lifting collar **320** is a collar hook **322**. Collar hook **322** works together with movable arm hook **324** to receive support chain **326**. Collar hook **322** and movable arm hook **324** are connected by a support chain **326**, extending therebetween and slidably mounted thereover. With four support chains **326** in position on each of four pairs of collar hook **322** and movable arm hook **324**, slidable member **164** is supported very strongly for greatly extended arms and heavier weights.

While movable arm hook **324** may be welded or otherwise secured to slidable member **164**, it is possible to provide arm sleeve **330** with movable arm hook **324** welded or otherwise secured thereto as shown in FIG. **8**. Arm stop **332** is welded or otherwise secured to slidable member **164** to restrict inward movement of arm sleeve **330**. Support chain **326** can then also be used. Movable arm hook **324** provides long arms and a large diameter heavy item to be lifted.

This application—taken as a whole with the specification, claims, abstract, and drawings—provides sufficient information for a person having ordinary skill in the art to practice the invention disclosed and claimed herein. Any measures necessary to practice this invention are well within the skill of a person having ordinary skill in this art after that person has made a careful study of this disclosure.

Because of this disclosure and solely because of this disclosure, modification of this method and apparatus can become clear to a person having ordinary skill in this particular art. Such modifications are clearly covered by this disclosure.

What is claimed and sought to be protected by Letters Patent of the United States is:

1. An adjustable lifting device for raising and transporting a heavy item comprising:

the adjustable lifting device including a lifting frame;

a first adjustable arm, a second adjustable arm, a third adjustable arm and a fourth adjustable arm for the adjustable lifting device being substantially parallel to and secured to the lifting frame, and radially spaced around the lifting frame;

the first adjustable arm, the second adjustable arm, the third adjustable arm and the fourth adjustable arm being substantially similar in construction;

lifting arm for the adjustable lifting device being secured to and substantially perpendicular to the lifting frame;

the first adjustable arm having a fixed tubular member, a movable tubular member and an adjusting means for releasably securing the movable tubular member in the fixed tubular member;

the fixed tubular member being secured to the frame;

the adjusting means including an arm securing means for releasably securing the movable tubular member in the fixed tubular member in a male-female relationship;

the arm securing means serving to fix and adjust a length of the first adjustable arm;

the movable tubular member having a first attaching arm end oppositely disposed from a second attaching arm end thereof;

the first attaching arm end having a first shape adapted to fit a first type of a heavy item; the second attaching arm end having a second shape adapted to fit a second type of a heavy item; the movable tubular member being slidably mounted in the fixed tubular member;

the movable tubular member being completely removable from the fixed tubular member;

the lifting arm being substantially centrally located on the lifting frame;

the lifting arm being secured to the lifting frame at a first lifting arm end;

the lifting arm having a second lifting arm end oppositely disposed from the first lifting arm end;

the second lifting arm end having an attaching mechanism to receive a lifting mechanism;

the lifting mechanism being suitable for lifting and moving the adjustable lifting device with the heavy item secured thereto;

the frame being a substantially flat sheet;

a first reinforcing means securing the lifting arm to the lifting frame;

the first reinforcing means including a first flat member, a second flat member, a third flat member, and a fourth flat member each being substantially similar in shape;

the first flat member having a right triangular shape secured to the lifting arm;

the first flat member being secured to the fixed tubular member of the first adjustable arm and the lifting arm; the second flat member being secured to the fixed tubular member of the second adjustable arm and the lifting arm; the third flat member being secured to the fixed tubular member of the third adjustable arm and the lifting arm; and the fourth flat member being secured to the fixed tubular member of the fourth adjustable arm and the lifting arm; and

the arm securing means including a locking bolt movable mounted in the fixed tubular member and capable of contacting the movable member to fix a position thereof to thereby adjust a length of the first adjustable arm.

2. The adjustable lifting device of claim **1** further comprising:

the second attaching arm end having a chain attached thereto at a first link end thereof; the chain having a second clamp end oppositely disposed from the first link end thereof; and the second clamp end further including a clamping means to hold the heavy item and assist in lifting and moving the heavy item.

3. The adjustable lifting device of claim **2** further comprising:

a second reinforcing means joining the lifting arm to the first adjustable arm, the second adjustable arm, the third adjustable arm and the fourth adjustable arm;

the second reinforcing means including a first means for connecting the first adjustable arm to the lifting arm;

the second reinforcing means including a second means for connecting the second adjustable arm to the lifting arm;

the second reinforcing means including a third means for connecting the third adjustable arm to the lifting arm;

the second reinforcing means including a fourth means for connecting the fourth adjustable arm to the lifting arm;

the first means for connecting, the second means for connecting, the third means for connecting and the fourth means for connecting being substantially similar in construction;

the second reinforcing means including four lifting arm hooks being secured to and radially spaced about a lifting arm collar;

the lifting arm collar including a tubular member capable of receiving the lifting arm and positioning the lifting arm hook for use; and

the lifting arm stop means being secured to the lifting arm to support the lifting arm collar at a desired position;

the second reinforcing means including an adjustable arm collar having an adjustable arm hook secured thereto;

the adjustable arm collar being slidably mounted on each of the first adjustable arm, the second adjustable arm, the third adjustable arm and the fourth adjustable arm; and

a chain connecting each lifting arm hook to the adjustable arm hook.

* * * * *